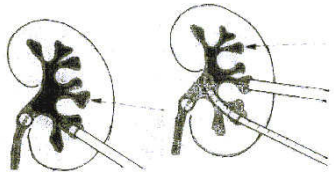
Complications of PCNL: How to avoid and manage them



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Recommendations

An exhaustive meta-analysis completed by the panel revealed a lower complication rate and higher stone free rate when PCNL was used as opposed to open, ESWL or combination of PCNL and ESWL.

Based on this the ***2005 updated AUA guidelines*** recommends That ***PCNL be the first line treatment for full staghorn calculi***

AUA Guidelines 2005

Management of Renal Calculi

- > 2.5 cm PCNL
- < 2.5 cm ESWL
- PCNL: 95% success rate
- ESWL: 65-75%
  - < 1cm: 64-92%
  - 1-2 cm: 59-89%
  - > 2 cm 39-70%

AUA Guidelines 1997
EAU Guidelines 2007

PCNL

- First line treatment for large or multiple kidney stones
- Generally safe treatment
- Low but specific complication rate

AUA Guidelines 2005
EUA Guidelines 2007

Complications during PCNL

- Review of the literature:
  - Major complications
    - Bleeding requiring intervention 0.6-1.4%
    - Pleural injury 2.3-3.1%
    - Colonic injury 0.2-0.8%
    - Septicemia 0.9%-4.7%
  - Minor complications:
    - Bleeding requiring transfusions <8%
    - Insignificant bleeding
    - Fever
    - Pain

MS Michel et al *Eur Urol* 2007

How to avoid complications

- Patient selection and preparation
- Calyceal selection and tract dilation

Patient selection

- Absolute contraindications:
  - Untreated coagulopathy
  - UTI
  - Pyelonephrites
- Relative contraindications:
  - Diabetes
  - Pulmonary disease
  - Cardiovascular disease
  - Obesity

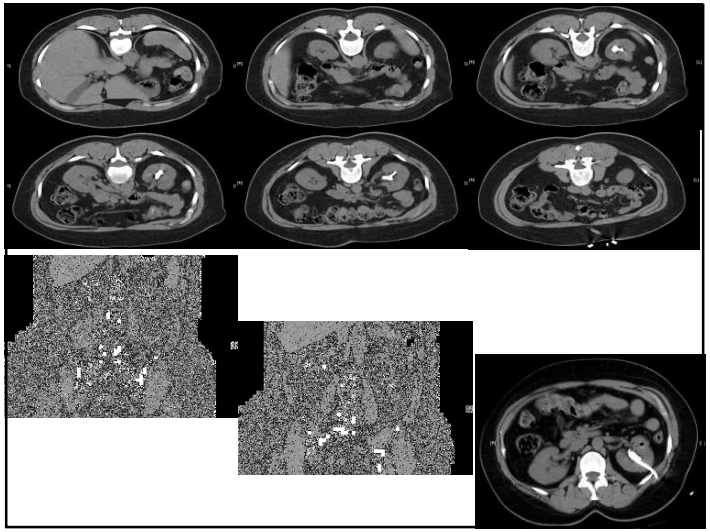
Preparation of patients

- Definition of stone size and collecting system anatomy:
  - US + IVP
  - CTU (CT plus pyelogram)
    - Supine
    - Prone

Advantages of prone CTU

- Selecting the target calyx
- Delineates surrounding structures
  - -Pleura
  - -Colon
  - -Duodenum
  - -Liver
  - -Spleen

Full Staghorn Left Calculi



Technique

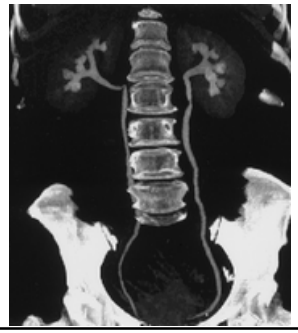
Positioning of the patient

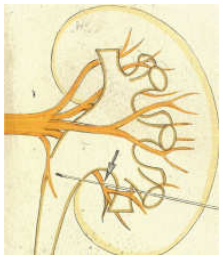
- Prone
  - Conventional position
- Oblique prone
- Prone slit-leg
  - Combined procedures (PCNL and URS)
- Supine
  - Anesthesiological advantages
  - Combined procedures (PCNL and URS)
  - Descending drainage
  - Less X-Ray exposure
  - Longer learning curve

MS Michel et al *Eur Urol* 2007
J.E. Lingeman *A.D. Smith, Editor* 1995
RM Scarpa *Eur Urol* 1998
Valdivia Uria JG *J Urol* 1998

Technique

- Target the calyx
  - Puncturing the renal pelvis or the infundibulum leads to an increased risk of vascular injury



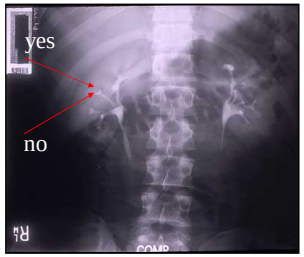


MS Michel et al *Eur Urol* 2007

Technique

Consider the angle of entry

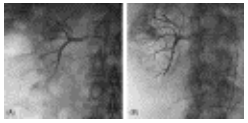
- Minimize the angle between the tract and the targeted infundibulum
- During rigid nephroscopy be wary of applied torque
  - Prior surgery



How to Manage Bleeding

- Terminate procedure
- Place a nephrostomy tube
  - Clamp it for 60 minutes if bleeding does not stop
- Other option
  - Council tip catheter and balloon insufflation

- If persistent bleeding
  - Renal angyography
  - Superselective embolization



Organ Injury

- Pleura
- Duodenum
- Colon
- Spleen

Pleura

- How to avoid pleural injury
  - Pre-planning CTU (prone)
  - Puncture under US guidance
  - Exhalation
- How to treat pleural injury
  - Pneumothorax, Hydrothorax, Hemothorax
    - Chest tube

Duodenum and Colon

- Risks of perforation up to 1%
- Risk factors:
  - Left-side procedures
  - Horseshoe kidney
  - Previous jejunoileal surgery

A.R. El-Nahas *Urology 2006*

Duodenum and Colon

- How to prevent perforation
  - Pre-planning CTU (prone)
  - Puncture with US
  - Patient selection
    - Previous bowel surgery
- How to treat bowel injury
  - –Intraperitoneal
    - •Surgery
  - –Extraperitoneal
    - •Conservative treatment
      - –DJ stent
      - –Nephrostomy tube withdrawn into the colon
      - –Antibiotics x 7-10 days
      - –Colostomy tube radiogram after 7-10 days

Spleen

- Very rare
- Associated with punctures above 12th rib
- Usually ends with splenectomy

Septicemia

- Rate from 0.9 to 4.7%
- Causes
  - Infected stones
  - Prolonged operative time
- Treatment:
  - Forced diuresis
  - Antibiotic treatment
  - Optimal kidney drainage
  - Electrolytes control

How to maximize success

- Check all instruments prior to procedure
- Balloon vs. Amplatz dilators
  - –Balloon
    - •Faster
    - •Easier
    - •Better visualization
      - –Minimizes blood in the collecting system
- Minimize time between dilation and nephroscopy
  - –Be prepared!
- •Always prepared to urgently terminate procedure

Take-home message

- Identifying and Accessing the Target Calyx
  - Prone CTU
  - Minimize the infundibular/tract angle

High success rate

Low complication rate

Thank You